

REMARKS

In accordance with the foregoing, claims 1, 4, 6-7 and 28 have been amended. Claim 2-3, 5, and 25 have been cancelled. Claims 1, 4, 6-24, and 26-33 are pending and claims 1, 4, 6-8, and 28 are under consideration.

No new features and/or new matter have been added. Accordingly, entry and approval of claims 1, 4, and 6-7 is respectfully requested.

I. AMENDMENT TO THE CLAIMS

Claim 1 has been amended to incorporate the features of claims 2, 3, and 5 to overcome the rejections presented in Item 4 of the Office Action. The language incorporated from claim 5 has been edited for clarity to prevent potential rejection of amended claim 1 on grounds similar to the 35 U.S.C. § 112 rejection in Item 2 of the Office Action.

Claims 4 and 6-7 have been amended to depend from amended claim 1 because claims 2-3 have been cancelled. "Particulates" has been added to claim 7 to preserve antecedent basis for the chemically modified starch (B).

II. REJECTION OF CLAIM 5 UNDER 35 U.S.C. § 112

Claim 5 has been cancelled. Therefore, the rejection has been resolved and should be withdrawn, which is respectfully requested. Further, the language of claim 5 incorporated into claim 1 has been edited for clarity to prevent a possible similar rejection in a subsequent Office Action.

III. REJECTION OF CLAIMS 1-3 AND 5-8 UNDER 35 U.S.C. § 103

The Office Action rejects claims 1-3 and 5-8 under 35 U.S.C. § 103 over Ajioka et al. (US 5,444,107) (hereinafter "Ajioka") in view of Tokiwa et al. (US 6,669,771) (hereinafter "Tokiwa"), Nangeroni et al. (US 6,183,814) (hereinafter "Nangeroni"), and Bastioli et al. (US 7,176,251) (hereinafter "Bastioli"). As explained below, claims 1 and 6-8 are nonobvious over Ajioka, Tokiwa, Nangeroni, and Bastioli.

1) Ajioka et al.

In rejecting claims 1-3 and 5-8, the Office Action cites Ajioka as the primary reference. Ajioka may describe a film obtained from a composition comprising a polylactic acid, a modified starch, and, optionally, a plasticizer. However, Ajioka does not disclose a film or sheet having both adequate film-forming stability and excellent matte properties (i.e. controlled gloss), an

objective which may be achieved by the claimed embodiment of the present invention. In fact, it is the specific composition comprising polylactic acid resin and chemically modified starch instantly claimed that may ultimately provide a film or sheet with matte properties.

In contrast, such a matte film cannot be achieved from the teachings of Ajioka. The Examples and Comparative Examples of Ajioka disclose films having a smooth surface and not a matte finish. Further, the Office Action acknowledges Ajioka "does not explicitly disclose the recited gloss values." Therefore, it is clear that the teachings of Ajioka are insufficient to produce a composition capable of producing film with matte properties.

2) Ajioka in view of Tokiwa, Nangeroni and Bastioli.

The Office Action asserts that claims 1-3 and 5-8 would have been obvious over Ajioka in combination with Tokiwa, Nangeroni, Bastioli. The Office Action asserts that the references teach using known additives, such as matting agents, and known film processing methods, such as applying rough-surface rollers, to produce matte films.

However, none of the references discloses the specific constitution of the claimed composition, the specific constitution including the claimed weight proportions of polylactic acid to modified starch. In addition, none of the references discloses or suggests improving the matte properties in the manner by which it may be achieved through the claimed composition described above. Accordingly, even if Tokiwa, Nangeroni, and Bastioli are combined with Ajioka, it would not have been obvious to achieve the claimed film having excellent matte properties.

3) Tokiwa et al.

As one way to achieve the matte characteristic of claim 1, the Examiner argues that Tokiwa et al. (US 6,669,771) discloses that it is well-known in the art to incorporate matting agents into polylactic acid-based compositions in order to modify the surface appearance of the film. However, Tokiwa et al. is different from Ajioka et al. in that it relates to a biodegradable resin composition having improved biodegradability, antibacterial properties, consistent mechanical properties. *Id.* at Abstract, column 1, line 55 to column 2, line 20. The novel feature of Tokiwa et al. appears to be a "mannan digestion product" which provides these three characteristics. See Tokiwa et al. column 1, line 66 to column 2, line 20. Tokiwa et al. appears to disclose almost nothing about the surface appearance of a film or sheet.

Further, the Tokiwa et al. passage (col. 6, lines 59-67) which the Examiner relies upon is tangential to the main objectives of Tokiwa et al. and a significantly limited disclosure. The

column 6 passage is the only place in the reference where "matting agents" are discussed. The recitation of "matting agents" is included as part of broad list of functionalizing or function improving additives. Very few details are given regarding these additives (e.g. names of particular matting agents, effective proportions, instructions on combining). What little is taught by the reference regarding these additives, is ambiguous. For example, although the cited paragraph explains that additives may be incorporated "in any proportions," it later teaches that certain compounds can only be added "[a]s long as the effects of the invention are not adversely affected." Further, Tokiwa et al. does not actually disclose that adding matting agents to produce this effect is "well known." It is questionable whether Tokiwa et al. could be considered enabling as to the addition of matting agents to PLA compositions.

4) Bastioli et al.

The Examiner relies on Bastioli et al. (US 7,176,251) to teach the weight content of the plasticizer. Bastioli et al. discloses that "plasticizers are generally from 1 to 100%, preferably from 10-30% by weight relative to the starch." Bastioli et al. at column 5, lines 17-19. The Examiner does not describe that the Bastioli et al. plasticizers are "relative to the starch."

Regarding the limitations of cancelled claim 5, it should be noted that Bastioli et al. discloses a microstructure wherein "the average numeral size of the starch particles is between 0.1 and 0.5 μ and more than 80% of the particles have a size of less than 1 micron." Bastioli et al. at column 3, lines 54-55. However, claim 5 refers to the average particle cross sectional area of the 20% largest starch particles. Claim 5 recites an area of 20,000 nm² or greater. The average area of claim 5 is calculated from a subgroup of the starch particles, not the particles as a whole.

5) Nangeroni et al.

As another way to achieve the matte characteristic of claim 1, the Examiner relies on Nangeroni et al. (US 6,183,814) and argues that there are well-known techniques to add a matte surface to a polylactic acid film. The Examiner argues the modification of Nangeroni et al. would improve the handling properties of the Ajioka et al. films.

Even though both Nangeroni et al. and Ajioka et al. disclose compositions comprising polylactic acid resins and starch (Abstract) which may be used to make food packaging, there

are significant differences between the references. Nangeroni et al. concerns a coated paper product, a method for coating paper, and articles produced from the coated paper product.

The coating described in Nangeroni et al. may be used on a paper cup to retain a beverage without leakage. The coating of Nangeroni et al. could be used instead of a wax or polypropylene coating, to improve biodegradability. See Nangeroni et al. at Abstract, column 2 line 32 to column 3, line 5. The Ajioka reference relates to a degradable polymer composition for films, filaments and packaging materials, and particularly food packaging materials. Applicants do not see how the Ajioka packaging material could possibly be treated with the rough-surfaced rollers of Nangeroni et al.

Further, Nangeroni et al. permits a starch content that would be impermissible in the Ajioka et al. compositions. When Nangeroni et al. uses starch as an inorganic filler, the reference teaches a maximum of 10%, preferably 5% starch. This is less than all Examples used in the Ajioka reference. Moreover, Ajioka teaches that the starch content is important. Ajioka teaches that higher starch contents increase the composition's biodegradability while lower starch contents increase the composition's tear strength. Ajioka et al. at column 3, lines 41-52.

In accordance with the foregoing, a *prima facie* case of obviousness has not been made because one having ordinary skill in the art would not have combined Ajioka Tokiwa, Nangeroni, and Bastioli to obtain the composition of amended claim 1. Further, even if the references could be combined, the combination does not disclose all of the features claimed.

As such, amended claim 1 is nonobvious over Ajioka in view of Tokiwa, Nangeroni and Bastioli. The rejection of amended claim 1 should be withdrawn, which is respectfully requested. Further, rejected claims 6-8 depend from allowable amended claim 1, rejection of claims 6-8 should be withdrawn, which is respectfully requested.

IV. REJECTION OF CLAIM 4 UNDER 35 U.S.C. § 103

1) Tanaka (US 6,495,679)

Tanaka is directed to improving the thermoplasticity of a starch by esterifying the hydroxyl groups of the starch. In Tanaka, the Tg value of the esterified starch depends on the number of carbon atoms of the organic acid used in the esterification and on the degree of the esterification attained.

A primary objective of Tanaka is to improve the "compatibility" of the starch ester with a biodegradable resin without using a plasticizer. Tanaka describes that compatibility¹ with biodegradable polymers decreases as Tg increases, that it is difficult to achieve sufficient compatibility without a plasticizer when Tg is 140°C or higher, and that Tg is preferably from 80 to 130°C. Tanaka further describes that an esterified starch with a Tg from 80 to 130°C has improved compatibility with other resins even in the absence of a plasticizer, and that a plasticizer is needed to improve compatibility when the Tg is 140°C or higher.

2) The significance of Tg of chemically modified starch in the present invention

The Office Action rejects claim 4 over Ajioka in view of Tokiwa, Nangeroni, Bastioli, and further in view of Tanaka (US 6,495,679). Office Action asserts that Tanaka teaches the claimed the glass transition temperature. The Office Action asserts that Tanaka discloses that glass transition values of 80-140° C are well-known in the art to improve compatibility between starches and other resins and to reduce the need for plasticizers.

One purpose of the claimed composition is to achieve a matte film or sheet having an adequate film-forming stability. Rather than producing films with good component compatibility, the claimed composition is directed to producing films or sheets having excellent matte properties. To obtain excellent matte properties it is necessary for the modified starch to form the domains of the claimed micro phase-separation structure. To obtain the claimed matte properties it is also necessary for a specific amount of the modified starch domains to be at or above a specific minimum size. In this view, it has been found that such preferable matte properties may be obtained when the Tg of the modified starch is in the range of 100 to 170°C.

Therefore, it stands to reason that greater compatibility of the modified starch component would have an adverse affect on matte properties of the film. Greater compatibility allows for fine and well-dispersed starch domains, or even starch completely and uniformly dissolved in the matrix phase. The adverse effects of "good compatibility" are clearly shown from the electron micrographs and Table 7 of the Specification.² The figures and data show that higher compatibility starches (i.e. a finer and more uniformly dispersed domain phase) adversely affect the matte finish of the film. Thus, to incorporate the improved-compatibility starches of Tanaka

¹ Tanaka defines compatibility as "the state of two or more materials in which they are uniformly and mutually dispersed, including not only the state attained by mixing two or more materials having mutual miscibility, but also the state where two or more materials, although being mutually 'immiscible', are uniformly dispersed."¹ Tanaka at column 7, lines 6-11.

² Figs. 2 and 3 correspond to Example A18; Fig. 4 corresponds to Example A1; Figs. 5 and 6 correspond to Example A24; Fig. 7 corresponds to Example A36; Fig. 8 corresponds to Example A37.

would adversely affect the matte properties of a film containing such starches because films with smaller chemically modified starch domains have inferior matte properties.

Further, in the claimed composition the micro phase-separation structure is affected by the type of plasticizer added. The claimed composition achieves the matte finish even though a plasticizer is a component. On the other hand, the purpose of Tanaka is to achieve good compatibility without a plasticizer.

Therefore, the underlying technology of the claimed film or sheet is completely different from that of Tanaka. Similarly, the film or sheet of amended claim 4 would not have been obvious in view of Tanaka because the principal of operation underlying Tanaka and amended claim 4 are different. Further, to arrive at amended claim 4 the principal of operation underlying the Tanaka compositions would have to be impermissibly changed in order to combine Tanaka with the other references in a way that would disclose amended claim 4.

In accordance with the foregoing, amended claim 4 is nonobvious under 35 U.S.C. § 103 over Tanaka and the cited references. Amended claim 4 also depends from allowable amended claim 1, and is therefore nonobvious for all of the reasons presented in the preceding sections. Therefore the rejection should be withdrawn, which is respectfully requested.

V. THE REJECTIONS OF CLAIMS 2-3, 5, and 25 UNDER 35 U.S.C. § 103

The rejections of claims 2-3, 5, and 25 under 35 U.S.C. § 103 have been resolved because claims 2-3, 5, and 25 have been cancelled. Therefore, the rejections of claims 2-3, 5, and 25 should be withdrawn, which is respectfully requested.

VI. REJECTION OF CLAIM 28 UNDER 35 U.S.C. § 103

The Office Action rejects claim 28 over Ajioka in view of Tokiwa, Nangeroni, Bastioli, and further in view of DE 29710825 (hereinafter "DE '825") or Loercks et al. (US 6,235,815) (hereinafter "Loercks"). The Office Action asserts that DE '825 and Loercks disclose that it is well known to use biodegradable resin compositions to form wall covering materials.

Although the references cited may disclose wallpaper materials comprising a polylactic acid and a starch-based material, such wallpaper materials are used in the wallpaper itself. On the other hand, the film or sheet of claim 28 is laminated or stacked on other wallpaper materials to provide the wallpaper with an antifouling function without impairing the quality appearance thereof. The references cited do not disclose laminating or stacking a film or sheet as claimed, and therefore the present invention is not obvious over the prior art.

Therefore, amended claim 28 is nonobvious over DE '825, Loercks, and the other cited references. Amended claim 28 also depends from allowable amended claim 1, and is therefore nonobvious for all of the reasons presented in the applicable sections above. Therefore the rejection should be withdrawn, which is respectfully requested.

VII. CONCLUSION

There being no further outstanding objections or rejections, it is submitted that the application is in condition for allowance. An early action to that effect is courteously solicited.

Finally, if there are any formal matters remaining after this response, the Examiner is requested to telephone the undersigned to attend to these matters.

If there are any additional fees associated with filing of this Amendment, please charge the same to our Deposit Account No. 19-3935.

Respectfully submitted,

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